

LH : HC :: B'E : EC, and therefore the triangle LHC is similar to the triangle B'EC.

And because LH : HJ :: BF : FA :: B'E : EA and LH : HC :: B'E : EC, therefore HJ : HC :: EA : EC, and therefore the triangle CHJ is similar to the triangle CEA, and the whole triangle LCJ is similar to the triangle B'CA, that is, CJ : CL :: CA : CB, and LCJ is a right angle. The position therefore of the orbit is found.

To find the Line of Nodes.—Produce JL to meet AB in M. Join CM. CM is the line of nodes, and the angle it makes with CA or CB is therefore determined (fig. 1).

To find the Inclination.—Draw FN perpendicular to the line of nodes. Then if γ is the inclination, $\cot \gamma = \frac{NF}{FH}$ and γ is therefore known.

To find the Position of the Perihelion on the Orbit.—This is the angle MCJ = $90^\circ + MCL$.

Draw MO parallel to BB' to meet AE in O; join CO. Then the angle MCL is equal to the angle OCB'.

Fig. 3 is a perspective view of the two orbits, and of the lines used in the construction.

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Since the above paper was read I have received No. 1227 of the *Astronomische Nachrichten*, and find that it contains a geometrical solution by Thiele of the same problem. Thiele's solution is very much simpler and better, and mine is nothing therefore but a geometrical exercise, which has the advantage of exhibiting the two orbits in their connexion with one another, and its method may have useful application in solid geometry, and so I let it stand.

American Preparations and Stations for the Observation of the Transit of Venus of 1874.

(Extract of a Letter from Rear-Admiral B. F. Sands to the Astronomer Royal.)

In answer to your letter of February 27, I have much pleasure in making known to you our plans for the observation of the Transit of *Venus*, so far as they have been matured.

As to the mode of observing, our main reliance will be upon photographs of the Sun, with *Venus* on his disk, taken on the plan described by Professor Newcomb in Part I. of the "Papers relating to the Transit of *Venus*." In applying this plan, it will be admissible to choose stations where the Sun shall be 10° or more above the horizon during the entire period of the transit, and

where the effect of parallax shall be to change the average distance of centres as much as possible during the transit. The favourable Northern stations will all be selected on the coast of China, Japan, and Siberia; one probably at Wladiwostok (Lat. $43^{\circ}7'$; Long. $8^{\text{h}}48^{\text{m}}$); one at or near Yokohama; one near Peking, or between Peking and the coast; and the fourth somewhere in Japan, China, or the adjacent islands.

In the Southern hemisphere satisfactory stations are much more difficult to find. Our choice seems to be confined to Kerguelen Land, Tasmania, Southern New Zealand, and Auckland or Chatham Island, subject to the consent of the British Government. The most favourable of these stations is probably Kerguelen Land, which you mention among those you purpose to occupy yourself, and which I believe the Germans also intend to occupy.

It is a delicate question whether there are not very grave objections to having so many stations together, the answer to which must mainly depend on whether similar methods of observations are to be employed by the different parties. The force of the objection is greatly diminished by the circumstance that our method of photographing is not to be employed by any other nation. Still the comparative inaccessibility of that point allows me to speak with little confidence of our ability to occupy it.

In addition to these photographic stations, it is our wish to comply with your desire that we should occupy a contact station in the Pacific. Here we prefer one of the Sandwich Islands, as distant as possible from the point which you may select. The objection to occupying a station so near yours seems to be counter-balanced by the very favourable conditions of that group, both astronomically and meteorologically, and by its accessibility from our western coast.

As both contacts will be visible from all the photographic stations, it is intended to observe them with 5-inch equatorials, with clock-work and micrometer for measuring cusps, one of which will be sent to each station. As the factor for "ingress accelerated" will be about as great at Wladiwostok and at Yokohama as it will be at Tahiti, it does not seem necessary to occupy the latter station in addition, and besides, only one contact can be seen either at Tahiti or Marquesas, while the Asiatic stations are about equally favourable for both contacts.

Each station will also be furnished with a portable transit, accompanied by clock and chronograph, for the determination of local time. This transit will be supplied with a fine spirit-level and declination micrometer for use as a "zenith telescope." For longitude, we shall probably depend mainly on occultations of small stars to be observed with the 5-inch telescopes. It is hoped by careful watching to observe eight or ten occultations per month, mostly when the Moon is near her conjunction, and while she is passing the Milky Way. It is believed that occultations are much more free from systematic errors than Moon-culminations.

these methods the Russians have made ample provision, so have the American astronomers, and the Germans will occupy at least one station, Tchefoo, specially for these methods. Every preparation is being made, in fact, for Northern work (except only that our North Indian region, available for these methods as well as Delisle's, is not sufficiently provided for). But now what is there to balance all this, in the Southern hemisphere? *Of really first-class stations there are but three which have even been mentioned,—viz., Crozet Island, Macdonald Island, and Kerguelen Island. Of these only Kerguelen Island has been actually selected; and here bad weather is almost a certainty. Of the other stations Canterbury (N.Z.), Chatham Island, Bourbon, Mauritius, and Rodriguez, it is only necessary to remark that they are very inferior for these three important methods.*

It is on this account chiefly that I have been earnest in my appeal for the occupation of Antarctic and sub-Antarctic stations. If anything were required to add to my anxiety on this subject, it would be found in the manifest reliance placed by Russia, America, and Germany, on the methods in question.

I am concerned to think that reconnaissances over the regions between Kerguelen Island, Enderby Land, Possession Island, and Auckland Island, may be absolutely necessary for a proper choice of stations; that such reconnaissances might have been made since I first dwelt on these matters four years ago; and that possibly had I been earnest in advocating these considerations during the last four years, either Great Britain or America might before this have found suitable observing stations in the above named region. I judged it best simply to indicate the state of the case and wait. I fear I may have been mistaken, though it is difficult to see what could have been done until the approach of the event itself and the declared intentions of other countries enforced attention to the circumstances I have touched upon. I trust it may still not be too late to provide for an adequate number of Southern stations sufficiently far apart to give proper chances of success. I do not hesitate to say that in my opinion the provision hitherto made is altogether inadequate, so far as Southern stations are concerned.

A Graphical Representation of the Circumstances of the Transit of Venus in 1874, with a view to show the sufficiency of this method for the purposes of Prediction. By F. C. Penrose, Esq.

Notwithstanding the admirable diagrams which Mr. Proctor has laid before the Society, it may still be interesting that the subject should be looked at in various ways. I can hardly suppose but that Mr. Proctor, considering the great attention he